

Chapter 13 Test Bank

Student: _____

1. Which of the following is NOT a function of the respiratory system?
 - A. net uptake of carbon dioxide from the air and removal of oxygen from the blood
 - B. regulation of blood H^+ concentration
 - C. trapping of blood clots
 - D. phonation
 - E. defense against microbes

2. Which is TRUE about the pleural sac?
 - A. It is continuous with the atmosphere and protects the lungs from infection.
 - B. It is a closed sac surrounding each lung that contains only a tiny volume of lubricating fluid.
 - C. It is a closed sac surrounding each lung and contains a large volume of surfactant.
 - D. It is a closed, air-filled space surrounding both lungs that has a negative pressure compared to atmospheric pressure.
 - E. It is bounded by pleural membranes that are very thin, which allows for abundant gas exchange.

3. Which structure is NOT part of the "anatomical dead space?"
 - A. bronchiole
 - B. trachea
 - C. bronchus
 - D. respiratory bronchiole
 - E. terminal bronchiole

4. What is one function of the type II alveolar cells?
 - A. production of surfactant
 - B. secretion of mucus
 - C. phagocytizing bacteria and other foreign particles
 - D. make up the majority of the epithelial wall of the alveoli
 - E. lining the pleural space

5. Which of the following is most responsible for keeping the lung surface and the thoracic wall from separating?
 - A. the presence of surfactant
 - B. the negative pressure in the alveolar space
 - C. the force exerted by the external intercostal muscles
 - D. the surface tension of the intrapleural fluid
 - E. alveolar pressure is higher than atmospheric pressure

6. During an unforced exhalation/expiration, which would NOT be true?

- A. alveolar pressure is greater than atmospheric pressure
- B. intrapleural pressure is greater than alveolar pressure
- C. intrapleural pressure becomes less negative
- D. the diaphragm relaxes
- E. lung volume decreases

7. Which of these causes inhalation/inspiration?

- A. increase in the curvature (upward movement) of the diaphragm
- B. movement of the ribs closer together due to contraction of the internal intercostal muscles
- C. flattening (downward movement) of the diaphragm
- D. contraction of the abdominal muscles
- E. alveolar pressure increasing above atmospheric pressure

8. Which is normally TRUE about the intrapleural pressure?

- A. It is lower than alveolar pressure.
- B. It is between +5 and +10 mm Hg above atmospheric pressure at functional residual capacity.
- C. It alternates between being less than, and greater than, atmospheric pressure.
- D. During a passive exhale, it increases to a value above atmospheric pressure.
- E.

It is always the same as atmospheric pressure during a passive exhale.

9. The volume of air flowing into the alveoli during inhalation/inspiration is increased when there is an increase in which of these?

- A. airway resistance
- B. the pressure gradient from the atmosphere to the alveoli
- C. the pressure in the intrapleural space
- D. the curvature of the diaphragm
- E. the volume of air in the intrapleural space

10. Under normal circumstances, which of the following would result from an increase in transpulmonary pressure?

- A. inhalation/inspiration
- B. exhalation/expiration
- C. a collapsed lung
- D. pneumothorax
- E. emphysema

11. Which of the following statements regarding pulmonary surfactant is TRUE?

- A. It is secreted by type I alveolar cells.
- B. It increases the compliance of the lungs.
- C. It increases airway resistance.

- D. It is secreted into the intrapleural space.
- E. It can only interact with other lipid molecules.

12. Under what conditions is lung compliance increased?

- A. respiratory distress syndrome of the newborn
- B. prolonged shallow breathing
- C. cystic fibrosis
- D. emphysema
- E. asthma

13. Which of the following drugs, administered as an aerosol spray, would be most likely to help an infant with respiratory distress syndrome of the newborn?

- A. pulmonary surfactant
- B. a beta-adrenergic agonist
- C. a muscarinic agonist
- D. histamine
- E. a beta-adrenergic antagonist

14. Which of the following is a cause of asthma?

- A. loss of alveoli
- B. inflammation of the bronchioles
- C. elevation of intrapleural pressure to equal atmospheric pressure
- D. environmental chemicals that stimulate beta-2 adrenergic receptors
- E.

lack of pulmonary surfactant

15. Which of the following drugs, administered as an aerosol spray, would be most likely to help a victim of an asthmatic attack?

- A. pulmonary surfactant
- B. a beta-2 adrenergic agonist
- C. a muscarinic agonist
- D. histamine
- E. a beta-2 adrenergic antagonist

16. During a physical examination, Joe learns that his resting tidal volume is 550 ml; his average resting respiratory rate is 15 breaths per minute; his total lung capacity is 6000 ml; and his anatomic dead space is 150 ml. Joe's resting alveolar ventilation is

- A. 72.0 L/min
- B. 6.0 L/min
- C. 4.2 L/min
- D. 1.8 L/min
- E. 0.5 L/min

17. When lying down, a subject's respiratory rate is 12 breaths per minute, his anatomical dead space is 150 ml, and his minute ventilation is 7 L/min. Which of these is closest to his alveolar ventilation in liters per minute?

- A. 6.0
- B. 5.2
- C. 4.2
- D. 3.0
- E. 0.583

18. A respiratory physiologist has measured ventilation parameters for each of three subjects: Tidal volume (TV); Respiratory rate (RR), and Anatomic dead space volume (ADSV).

Which of the following statements accurately compares the alveolar ventilation in the three men?

- A. Tom's is the largest; Dick's and Harry's are the same.
- B. Tom's is the smallest; Dick's and Harry's are the same.
- C. Tom's is greater than Dick's, which is greater than Harry's.
- D. Dick's is greater than Harry's, which is greater than Tom's.
- E. Harry's is greater than Dick's, which is greater than Tom's.

19. Which of the following statements about the response of arteriolar smooth muscle to changing oxygen partial pressures is

TRUE?

- A. Both systemic and pulmonary arterioles respond to a decrease in P_{O_2} by constricting.
- B. Both systemic and pulmonary arterioles respond to a decrease in P_{O_2} by dilating.
- C. Systemic arterioles respond to a decrease in P_{O_2} by dilating but pulmonary arterioles constrict in response to decreased P_{O_2} .
- D. Systemic arterioles respond to a decrease in P_{O_2} by constricting but pulmonary arterioles dilate in response to decreased P_{O_2} .
- E. Changes in P_{O_2} do not affect arteriolar smooth muscle in the pulmonary system.

20. Which is TRUE regarding how gasses dissolve in liquids?

- A. The concentration of a particular gas in a liquid equilibrates to match the concentration of that gas in the air to which the liquid is exposed.
- B. Different gasses have the same solubility in liquids.
- C. The partial pressure of a gas in a liquid is equal to the amount freely diffusing in the liquid plus the amount bound to large molecules within the liquid.
- D. The partial pressure of a particular gas in a liquid equilibrates to match the partial pressure of that gas in the air to which the liquid is exposed.
- E. As the partial pressure of a particular gas in an air sample increases, the concentration of that gas in a liquid exposed to that air sample decreases.

21. Regarding the partial pressures of O_2 and CO_2 , which of the following statements is NOT true in a normal person at rest?
- A. Atmospheric P_{O_2} is greater than alveolar P_{O_2} .
 - B. The P_{CO_2} in air is less than alveolar P_{CO_2} .
 - C. The P_{O_2} in systemic arteries is typically greater than the alveolar P_{O_2} .
 - D. P_{CO_2} in the systemic veins is greater than systemic arterial P_{CO_2} .
 - E. P_{CO_2} in the pulmonary arteries is greater than pulmonary venous P_{CO_2} .
22. Regarding the relationships between the rates of oxygen consumption/carbon dioxide production and alveolar ventilation, which of these statements is TRUE?
- A. Increased ventilation without a similar increase in metabolism is called hypoventilation.
 - B. In hypoventilation, alveolar P_{CO_2} decreases below resting levels.
 - C. In hyperventilation, alveolar P_{CO_2} can decrease to zero.
 - D. A decrease in metabolism without a similar decrease in alveolar ventilation would result in hyperventilation.
 - E. An increase in ventilation with a matching increase in metabolism is called hyperventilation.
23. Which of these results from hyperventilation?
- A. increased alveolar P_{CO_2} and decreased alveolar P_{O_2}
 - B. an increase in both alveolar P_{CO_2} and P_{O_2}
 - C. decreased alveolar P_{CO_2} and increased alveolar P_{O_2}
 - D. a decrease in both alveolar P_{CO_2} and P_{O_2}
 - E. the same alveolar P_{CO_2} as under normal conditions
24. Which of the following is NOT true regarding ventilation-perfusion inequality?
- A. No inequality exists in normal lungs.
 - B. It may result from increased alveolar dead space.
 - C. It is increased from normal in patients with emphysema.
 - D. It is caused by too little or too much blood flow relative to ventilation.
 - E. It is caused by too little or too much ventilation relative to blood flow.
25. In which form is most of the oxygen carried in arterial blood?
- A. bound to hemoglobin
 - B. dissolved in the plasma
 - C. dissolved in the cytosol of erythrocytes
 - D. converted to HCO_3^-
 - E. bound to myoglobin
26. If all other factors remain the same, which of these results in an increase in the amount of oxygen bound

to hemoglobin?

- A. increased plasma [H⁺]
- B. increased plasma temperature
- C. increased plasma [2,3 diphosphoglycerate]
- D. increased plasma P_{O₂}
- E. increased plasma [carbon monoxide]

27. Which of these is demonstrated by the oxygen-hemoglobin dissociation curve?

- A. The greater the P_{O₂} of the blood, the greater the dissociation of O₂ from hemoglobin.
- B. At normal resting systemic arterial P_{O₂}, hemoglobin is almost 100% saturated with oxygen.
- C. At normal resting systemic venous P_{O₂}, only about 75% of the hemoglobin is in the form of deoxyhemoglobin.
- D. More additional oxygen binds to hemoglobin when going from a P_{O₂} of 60 to 100 mmHg, than is added when going from a P_{O₂} of 40 to 60 mmHg.
- E. As P_{O₂} increases, the saturation of hemoglobin with oxygen increases linearly.

28. Curve B below represents the oxygen-hemoglobin dissociation curve for normal body temperature, arterial hydrogen ion concentration, and DPG concentration.

- A. Curve A may represent the dissociation at higher than normal arterial H⁺ concentration.
- B. Curve C may represent the dissociation at lower than normal body temperature.
- C. Curve A may represent the dissociation at very low 2,3 diphosphoglycerate levels.
- D. Curve C may represent the dissociation at lower than normal arterial H⁺ concentration.
- E. Curve A may represent the dissociation at higher than normal body temperature.

29. Which of the following would cause a *decrease* in the binding affinity of hemoglobin for oxygen?

- A. increased pH of the blood
- B. increased temperature of the blood
- C. decreased DPG levels in erythrocytes
- D. the presence of carbon monoxide
- E. decreased concentration of H⁺ in the blood

30. Carbonic anhydrase catalyzes a reaction that combines which of the following?

- A. H₂O and O₂
- B. H₂O and CO₂
- C. H₂O and CO
- D. H⁺ and HCO₃⁻
- E. CO₂ and O₂

31. After CO₂ is produced by tissues, in what form is most of that carbon transported to the lungs for removal from the body?

- A. as dissolved CO₂

- B. bound to hemoglobin
- C. as H_2CO_3
- D. as dissolved HCO_3^-
- E. as carbonic anhydrase

32. Which of the following statements regarding the transport of CO_2 in blood is FALSE?

- A. Some of the CO_2 in blood is dissolved in plasma.
- B. Some of the CO_2 in blood is dissolved in the cytosol of erythrocytes.
- C. Some of the CO_2 in blood is bound to hemoglobin.
- D. Most of the CO_2 in blood is converted to another molecule.
- E. Some of the CO_2 in blood is converted to chloride.

33. Which is a result of hyperventilation?

- A. respiratory alkalosis
- B. respiratory acidosis
- C. increased blood P_{CO_2}
- D. metabolic acidosis
- E. metabolic alkalosis

34. Which occurs as a result of hypoventilation?

- A. the pH of the blood increases
- B. levels of blood O_2 increase
- C. levels of blood H^+ ions increase
- D. alveolar CO_2 decreases to near atmospheric levels
- E. alveolar oxygen increases toward atmospheric levels

35. Which of these correctly describes the chloride shift?

- A. In the lungs, chloride enters red blood cells in exchange for bicarbonate ions.
- B. In the tissues, chloride exits red blood cells in exchange for carbonic acid.
- C. In the tissues, chloride enters red blood cells in exchange for bicarbonate ions.
- D. In the lungs, chloride enters red blood cells in exchange for CO_2 .
- E. In the tissues, chloride enters red blood cells in exchange for CO_2 .

36. Which is a proposed benefit of hemoglobin's ability to bind and transport nitric oxide?

- A. It allows hemoglobin to resist the effects of small pH changes as a buffer molecule.
- B. By circulating into peripheral vessels, it will trigger vasodilation to improve local blood flow.
- C. As it circulates it promotes smooth muscle of arteries and arterioles to contract, to increase blood pressure as needed.
- D. It acts as an enzyme cofactor necessary to maintaining a "clean and smooth" endothelial lining within blood vessels.

E. It provides a carrier upon which additional electrolytes can be transported to deficient tissues in the body.

37. What brain center has neurons that fire mainly during inspiration and have input to the spinal motor neurons that activate the diaphragm and inspiratory intercostal muscles?

- A. the ventral respiratory group of the medulla oblongata
- B. the pre-Botzinger complex
- C. the dorsal respiratory group of the medulla oblongata
- D. the pneumotaxic center of the pons
- E. the apneustic center of the pons

38. Action potentials in neurons in the inspiratory center of the medulla result in action potentials in the _____ nerves to the diaphragm, which in turn cause _____ of the muscle, resulting in a/an _____ in the volume of the thoracic cage.

- A. motor; contraction; decrease
- B. parasympathetic; contraction; decrease
- C. sympathetic; contraction; increase
- D. motor; contraction; increase
- E. sympathetic; relaxation; increase

39. Which of the following are chemoreceptors?

- A. hair cells in the cochlea
- B. receptors in the aortic and carotid bodies
- C. baroreceptors in the aortic and carotid arch
- D. receptors that mediate the Hering-Breuer reflex

40. Which of the following is most responsible for detecting an increase in systemic arterial H⁺ concentration?

- A. the medulla of the brainstem
- B. the peripheral chemoreceptors
- C. the central chemoreceptors
- D. the diaphragm
- E. the dorsal respiratory group

41. What is the primary regulator of the magnitude of alveolar ventilation under normal circumstances?

- A. the H⁺ concentration in the brain extracellular fluid, which is monitored by central chemoreceptors
- B. The PO₂ of the arterial blood, which is monitored by central chemoreceptors
- C. The PO₂ of the arterial blood, which is monitored by peripheral chemoreceptors
- D. the H⁺ concentration in the arterial blood, which is monitored by central chemoreceptors
- E. stretch receptors in the lung

42. Which of the following statements regarding control of respiration is correct?

- A. A slight decrease in arterial P_{O_2} is a stronger stimulus for increased ventilation than is a comparable decrease in arterial P_{CO_2} .
- B. The most important signal for regulating ventilation is the H^+ concentration of arterial blood.
- C. Increased concentrations of lactic acid stimulate ventilation primarily by acting on peripheral chemoreceptors.
- D. An increase in the HCO_3^- concentration in blood stimulates ventilation.
- E. At high altitude, a decrease in P_{CO_2} of the blood stimulates an increase in ventilation.

43. Which of these would tend to increase ventilation?

- A. lower than normal blood PCO_2
- B. higher than normal blood pH
- C. breathing carbon monoxide
- D. iron-deficiency anemia
- E. breathing air with increased PCO_2

44. If the nerves from the carotid and aortic bodies are cut, which of these would occur?

- A. A decrease in arterial P_{O_2} will no longer increase ventilation.
- B. An increase in arterial P_{CO_2} will no longer increase ventilation.
- C. An increase in arterial lactic acid will inhibit ventilation.
- D. An increase in arterial P_{CO_2} will inhibit ventilation.
- E. A decrease in arterial P_{O_2} will inhibit ventilation.

45. Which of these does NOT increase during heavy exercise?

- A. minute ventilation
- B. arterial P_{CO_2}
- C. oxygen delivery to muscles
- D. oxygen extraction from the blood by muscles
- E. body heat production

46. Following strenuous exercise, blood levels of lactic acid are _____ compared to pre-exercise levels. This change in acid concentration causes a reflex _____ in ventilation by activating _____.

- A. decreased; decrease; peripheral chemoreceptors
- B. decreased; decrease; central chemoreceptors
- C. increased; increase; baroreceptors in the aortic arch
- D. increased; increase; central chemoreceptors
- E. increased; increase; peripheral chemoreceptors

47. Which of the following statements regarding hypoxia is correct?

- A. Exposure to high altitude is a form of hypoxic hypoxia.
- B. "Anemic hypoxia" refers to the condition of lower than normal arterial P_{O_2} .

- C. Carbon monoxide poisoning is an example of hypoxic hypoxia.
- D. Carbon monoxide poisoning is an example of ischemic hypoxia.
- E. Cyanide poisoning is an example of hypoxic hypoxia.

48. Which of the following conditions would result in a systemic arterial P_{O_2} lower than is typical of a healthy person at sea level?

- A. traveling to high altitude
- B. breathing 100% oxygen
- C. having iron-deficiency anemia
- D. breathing regular air in a hyperbaric chamber (higher than normal atmospheric pressure)
- E. maintaining alveolar ventilation constant while decreasing metabolic rate

49. Which is characteristic of a person chronically suffering from hypoxic hypoxia?

- A. higher-than-normal alveolar P_{O_2}
- B. higher-than-normal hematocrit
- C. higher-than-normal arterial P_{O_2}
- D. lower-than-normal lactic acid production
- E. lower-than-normal blood flow through tissues

50. Which correctly describes the cause of the increase in alveolar ventilation that occurs when a person ascends to high altitude?

- A. The decrease in P_{CO_2} of inspired air decreases alveolar P_{CO_2} , stimulating the peripheral chemoreceptors.
- B. The decrease in P_{CO_2} of inspired air decreases alveolar P_{CO_2} , stimulating the central chemoreceptors.
- C. The decrease in P_{O_2} of inspired air decreases alveolar and arterial P_{O_2} , stimulating the peripheral chemoreceptors.
- D. The decrease in total atmospheric pressure causes a greater negative pressure in the intrapleural space, resulting in deeper and more frequent breathing.
- E. The decrease in the total barometric pressure at high altitude causes hypocapnea, which stimulates peripheral chemoreceptors.

51. The diaphragm is a large sheet of smooth muscle that separates the thoracic cavity from the abdomen.
True False

52. If the parietal pleura is cut during surgery, the lung on the side of the cut will expand and the chest wall will be compressed.

True False

53. The process of ventilation includes both the transport of gases by bulk flow and the diffusion of gases into and out of the blood.

True False

54. According to Boyle's law, the pressure exerted by a constant number of gas molecules in a container is inversely proportional to the volume of the container. Therefore, increasing the volume of the container will cause a decrease in its pressure.

True False

55. During inhalation/inspiration, the total alveolar volume decreases.

True False

56. During inhalation/inspiration, the diaphragm contracts and the alveolar pressure is less than atmospheric pressure; during exhalation/expiration, the diaphragm relaxes and the alveolar pressure is greater than atmospheric pressure.

True False

57. In a normal person at rest, the part of the respiratory cycle in which no air is flowing through the airways and the respiratory muscles are relaxed is at the end of inhalation/inspiration, prior to exhalation/expiration.

True False

58. Exhalation/expiration of air from the lungs requires contraction of the exhalatory/expiratory intercostal muscles.

True False

59. Infants born prematurely frequently develop respiratory distress syndrome of the newborn because they have too few alveoli to exchange O_2 and CO_2 efficiently.

True False

60. The diameter of the airways in normal lungs is generally great enough that little resistance is offered to airflow.

True False

61. Emphysema is a disease characterized by low lung compliance, obstructed airways, and ventilation-perfusion inequality.

True False

62. A clinical sign of obstructive lung disease would be a reduced FEV1/FVC ratio.

True False

63. The total dead space in the lungs includes anatomic dead space and any portion of the alveoli that has little or no blood supply.

True False

64. Doubling the frequency of breathing will cause a greater increase in alveolar ventilation than will doubling the depth of inspiration.

True False

65. At sea level P_{O_2} is about 760 mm Hg.

True False

66. In the systemic circulation, the P_{O_2} of arterial blood exceeds the P_{O_2} of venous blood, while the reverse is true for the pulmonary circulation.

True False

67. Decreased alveolar P_{O_2} causes reflex vasodilation of the pulmonary arterioles.

True False

68. Most of the O_2 carried in the blood is dissolved in plasma.

True False

69. When blood flows into the systemic capillaries, the P_{O_2} of the erythrocytes is greater than the P_{O_2} of the plasma, causing a shift from oxyhemoglobin to deoxyhemoglobin.

True False

70. If lung disease results in an arterial P_{O_2} of 80 mm Hg, the total amount of oxygen carried by the blood is 20% below normal.

True False

71. Mixed venous blood in a resting individual still contains more than double the amount of oxygen extracted by the tissues as the blood passed through them.

True False

72. The affinity of hemoglobin for O_2 is decreased in rapidly metabolizing tissues.

True False

73. Of the CO_2 returning from the tissues in venous blood, more is dissolved in plasma as CO_2 than is bound to hemoglobin.

True False

74. Deoxyhemoglobin binds bicarbonate ion better than oxyhemoglobin does.

True False

75. Normally, all the H^+ ions generated from CO_2 in tissue capillaries recombine with bicarbonate in pulmonary capillaries and are removed from the body as CO_2 .

True False

76. The majority of hydrogen ions generated in the formation of carbonic acid in the tissues are carried as freely dissolved H^+ in the venous blood.

True False

77. When a person hyperventilates, there are lower than normal levels of P_{CO_2} and hydrogen ion in arterial blood, a condition called respiratory alkalosis.

True False

78. The rhythmic contractions and relaxations of the inspiratory muscles are dependent upon spontaneous depolarizations of the diaphragm.

True False

79. The neurons responsible for the cyclic nature of respiratory muscle function are located in the brain stem.

True False

80. The medullary inspiratory neurons receive inhibitory neural input from the pons and also from pulmonary stretch receptors.

True False

81. A decrease in arterial P_{O_2} stimulates increased ventilation by causing increased firing of action potentials in the afferent neurons from the carotid and aortic body chemoreceptors.
True False

82. A slight fall in arterial P_{CO_2} is a much stronger stimulus for increasing ventilation than a comparable fall in arterial P_{O_2} .
True False

83. The most important signal for regulating normal ventilation is hydrogen ions in the blood generated by lactic acid production.
True False

84. Increased plasma concentration of lactic acid stimulates increased ventilation primarily by means of central chemoreceptors.
True False

85. During moderate exercise, arterial P_{CO_2} and H^+ concentration increase and arterial P_{O_2} decreases, and these are the main stimuli causing increased ventilation.
True False

86. One cause of hypoxic hypoxia in disease is diffusion impairment of O_2 resulting from decreased alveolar surface area.
True False

87. Exposure to high altitude is a form of ischemic hypoxia.
True False

88. A small amount of carbon monoxide in the air would not significantly alter the P_{O_2} of inspired air nor the P_{O_2} of the arterial blood.
True False

89. The key difference between fetal hemoglobin and adult hemoglobin is that fetal hemoglobin has a lower affinity for oxygen, because the levels of oxygen in placental blood is 2 to 3 times higher than other systemic arteries.

True False

90. The control of respiration by centers in the brainstem can be over-ridden by higher brain centers when speaking, breath-holding, undergoing emotional reactions, and experiencing pain.

True False

91. Nonrespiratory functions of the lungs include acting as "filters" for removing certain chemicals and blood clots.

True False

Chapter 13 Test Bank **Key**

1. Which of the following is NOT a function of the respiratory system?

- A.** net uptake of carbon dioxide from the air and removal of oxygen from the blood
- B. regulation of blood H⁺ concentration
- C. trapping of blood clots
- D. phonation
- E. defense against microbes

Bloom's: Level 1. Remember
Learning Outcome: 13.09
Section: 13.09
Topic: Respiratory System

2. Which is TRUE about the pleural sac?

- A. It is continuous with the atmosphere and protects the lungs from infection.
- B.** It is a closed sac surrounding each lung that contains only a tiny volume of lubricating fluid.
- C. It is a closed sac surrounding each lung and contains a large volume of surfactant.
- D. It is a closed, air-filled space surrounding both lungs that has a negative pressure compared to atmospheric pressure.
- E. It is bounded by pleural membranes that are very thin, which allows for abundant gas exchange.

Bloom's: Level 1. Remember
Learning Outcome: 13.01
Section: 13.01
Topic: Respiratory System

3. Which structure is NOT part of the "anatomical dead space?"

- A. bronchiole
- B. trachea

- C. bronchus
- D.** respiratory bronchiole
- E. terminal bronchiole

Bloom's: Level 2. Understand
Learning Outcome: 13.02
Section: 13.02
Topic: Respiratory System

4. What is one function of the type II alveolar cells?
- A.** production of surfactant
 - B. secretion of mucus
 - C. phagocytizing bacteria and other foreign particles
 - D. make up the majority of the epithelial wall of the alveoli
 - E. lining the pleural space

Bloom's: Level 1. Remember
Learning Outcome: 13.01
Section: 13.01
Topic: Respiratory System

5. Which of the following is most responsible for keeping the lung surface and the thoracic wall from separating?
- A. the presence of surfactant
 - B. the negative pressure in the alveolar space
 - C. the force exerted by the external intercostal muscles
 - D.** the surface tension of the intrapleural fluid
 - E. alveolar pressure is higher than atmospheric pressure

Bloom's: Level 2. Understand
Learning Outcome: 13.01
Section: 13.01
Topic: Respiratory System

6. During an unforced exhalation/expiration, which would NOT be true?
- A. alveolar pressure is greater than atmospheric pressure
 - B.** intrapleural pressure is greater than alveolar pressure
 - C. intrapleural pressure becomes less negative
 - D. the diaphragm relaxes
 - E. lung volume decreases

Bloom's: Level 1. Remember
Learning Outcome: 13.02
Section: 13.02
Topic: Respiratory System

7. Which of these causes inhalation/inspiration?
- A. increase in the curvature (upward movement) of the diaphragm
 - B. movement of the ribs closer together due to contraction of the internal intercostal muscles
 - C.** flattening (downward movement) of the diaphragm

- D. contraction of the abdominal muscles
- E. alveolar pressure increasing above atmospheric pressure

Bloom's: Level 1. Remember
Learning Outcome: 13.02
Section: 13.02
Topic: Respiratory System

8. Which is normally TRUE about the intrapleural pressure?

- A.** It is lower than alveolar pressure.
- B. It is between +5 and +10 mm Hg above atmospheric pressure at functional residual capacity.
- C. It alternates between being less than, and greater than, atmospheric pressure.
- D. During a passive exhale, it increases to a value above atmospheric pressure.
- E.

It is always the same as atmospheric pressure during a passive exhale.

Bloom's: Level 1. Remember
Learning Outcome: 13.02
Section: 13.02
Topic: Respiratory System

9. The volume of air flowing into the alveoli during inhalation/inspiration is increased when there is an increase in which of these?

- A. airway resistance
- B.** the pressure gradient from the atmosphere to the alveoli
- C. the pressure in the intrapleural space
- D. the curvature of the diaphragm
- E. the volume of air in the intrapleural space

Bloom's: Level 2. Understand
Learning Outcome: 13.02
Section: 13.02
Topic: Respiratory System

10. Under normal circumstances, which of the following would result from an increase in transpulmonary pressure?

- A.** inhalation/inspiration
- B. exhalation/expiration
- C. a collapsed lung
- D. pneumothorax
- E. emphysema

Bloom's: Level 2. Understand
Learning Outcome: 13.02
Section: 13.02
Topic: Respiratory System

11. Which of the following statements regarding pulmonary surfactant is TRUE?

- A. It is secreted by type I alveolar cells.
- B.** It increases the compliance of the lungs.
- C. It increases airway resistance.
- D. It is secreted into the intrapleural space.
- E. It can only interact with other lipid molecules.

Bloom's: Level 1. Remember

Learning Outcome: 13.02

Section: 13.02

Topic: Respiratory System

12. Under what conditions is lung compliance increased?

- A. respiratory distress syndrome of the newborn
- B. prolonged shallow breathing
- C. cystic fibrosis
- D.** emphysema
- E. asthma

Bloom's: Level 2. Understand

Learning Outcome: 13.02

Learning Outcome: 13.08

Section: 13.02

Section: 13.08

Topic: Respiratory System

13. Which of the following drugs, administered as an aerosol spray, would be most likely to help an infant with respiratory distress syndrome of the newborn?

- A.** pulmonary surfactant
- B. a beta-adrenergic agonist
- C. a muscarinic agonist
- D. histamine
- E. a beta-adrenergic antagonist

Bloom's: Level 1. Remember

Learning Outcome: 13.02

Section: 13.02

Topic: Respiratory System

14. Which of the following is a cause of asthma?

- A. loss of alveoli
- B.** inflammation of the bronchioles
- C. elevation of intrapleural pressure to equal atmospheric pressure
- D. environmental chemicals that stimulate beta-2 adrenergic receptors
- E. lack of pulmonary surfactant

Bloom's: Level 2. Understand

Learning Outcome: 13.02

Section: 13.02

15. Which of the following drugs, administered as an aerosol spray, would be most likely to help a victim of an asthmatic attack?

- A. pulmonary surfactant
- B. a beta-2 adrenergic agonist**
- C. a muscarinic agonist
- D. histamine
- E. a beta-2 adrenergic antagonist

Bloom's: Level 2. Understand

Learning Outcome: 13.02

Section: 13.02

Topic: Respiratory System

16. During a physical examination, Joe learns that his resting tidal volume is 550 ml; his average resting respiratory rate is 15 breaths per minute; his total lung capacity is 6000 ml; and his anatomic dead space is 150 ml. Joe's resting alveolar ventilation is

- A. 72.0 L/min
- B. 6.0 L/min**
- C. 4.2 L/min
- D. 1.8 L/min
- E. 0.5 L/min

Bloom's: Level 3. Apply

Learning Outcome: 13.02

Section: 13.02

Topic: Respiratory System

17. When lying down, a subject's respiratory rate is 12 breaths per minute, his anatomical dead space is 150 ml, and his minute ventilation is 7 L/min. Which of these is closest to his alveolar ventilation in liters per minute?

- A. 6.0
- B. 5.2**
- C. 4.2
- D. 3.0
- E. 0.583

Bloom's: Level 3. Apply

Learning Outcome: 13.02

Section: 13.02

Topic: Respiratory System

18. A respiratory physiologist has measured ventilation parameters for each of three subjects: Tidal volume (TV); Respiratory rate (RR), and Anatomic dead space volume (ADSV).

Which of the following statements accurately compares the alveolar ventilation in the three men?

- A. Tom's is the largest; Dick's and Harry's are the same.
- B. Tom's is the smallest; Dick's and Harry's are the same.
- C. Tom's is greater than Dick's, which is greater than Harry's.
- D. Dick's is greater than Harry's, which is greater than Tom's.

E. Harry's is greater than Dick's, which is greater than Tom's.

Bloom's: Level 2. Understand
Learning Outcome: 13.02
Section: 13.02
Topic: Respiratory System

19. Which of the following statements about the response of arteriolar smooth muscle to changing oxygen partial pressures is

- TRUE?
- A. Both systemic and pulmonary arterioles respond to a decrease in P_{O_2} by constricting.
 - B. Both systemic and pulmonary arterioles respond to a decrease in P_{O_2} by dilating.
 - C.** Systemic arterioles respond to a decrease in P_{O_2} by dilating but pulmonary arterioles constrict in response to decreased P_{O_2} .
 - D. Systemic arterioles respond to a decrease in P_{O_2} by constricting but pulmonary arterioles dilate in response to decreased P_{O_2} .
 - E. Changes in P_{O_2} do not affect arteriolar smooth muscle in the pulmonary system.

Bloom's: Level 2. Understand
Learning Outcome: 13.03
Section: 13.03
Topic: Respiratory System

20. Which is TRUE regarding how gasses dissolve in liquids?

- A. The concentration of a particular gas in a liquid equilibrates to match the concentration of that gas in the air to which the liquid is exposed.
- B. Different gasses have the same solubility in liquids.
- C. The partial pressure of a gas in a liquid is equal to the amount freely diffusing in the liquid plus the amount bound to large molecules within the liquid.
- D.** The partial pressure of a particular gas in a liquid equilibrates to match the partial pressure of that gas in the air to which the liquid is exposed.
- E. As the partial pressure of a particular gas in an air sample increases, the concentration of that gas in a liquid exposed to that air sample decreases.

Bloom's: Level 1. Remember
Learning Outcome: 13.03
Section: 13.03
Topic: Respiratory System

21. Regarding the partial pressures of O_2 and CO_2 , which of the following statements is NOT true in a normal person at rest?

- A. Atmospheric P_{O_2} is greater than alveolar P_{O_2} .
- B. The P_{CO_2} in air is less than alveolar P_{CO_2} .
- C.** The P_{O_2} in systemic arteries is typically greater than the alveolar P_{O_2} .
- D. P_{CO_2} in the systemic veins is greater than systemic arterial P_{CO_2} .

E. P_{CO_2} in the pulmonary arteries is greater than pulmonary venous P_{CO_2} .

Bloom's: Level 2. Understand

Learning Outcome: 13.03

Section: 13.03

Topic: Respiratory System

22. Regarding the relationships between the rates of oxygen consumption/carbon dioxide production and alveolar ventilation, which of these statements is TRUE?

- A. Increased ventilation without a similar increase in metabolism is called hypoventilation.
- B. In hypoventilation, alveolar P_{CO_2} decreases below resting levels.
- C. In hyperventilation, alveolar P_{CO_2} can decrease to zero.
- D.** A decrease in metabolism without a similar decrease in alveolar ventilation would result in hyperventilation.
- E. An increase in ventilation with a matching increase in metabolism is called hyperventilation.

Bloom's: Level 2. Understand

Learning Outcome: 13.03

Learning Outcome: 13.07

Section: 13.03

Section: 13.07

Topic: Respiratory System

23. Which of these results from hyperventilation?

- A. increased alveolar P_{CO_2} and decreased alveolar P_{O_2}
- B. an increase in both alveolar P_{CO_2} and P_{O_2}
- C.** decreased alveolar P_{CO_2} and increased alveolar P_{O_2}
- D. a decrease in both alveolar P_{CO_2} and P_{O_2}
- E. the same alveolar P_{CO_2} as under normal conditions

Bloom's: Level 1. Remember

Learning Outcome: 13.07

Section: 13.07

Topic: Respiratory System

24. Which of the following is NOT true regarding ventilation-perfusion inequality?

- A.** No inequality exists in normal lungs.
- B. It may result from increased alveolar dead space.
- C. It is increased from normal in patients with emphysema.
- D. It is caused by too little or too much blood flow relative to ventilation.
- E. It is caused by too little or too much ventilation relative to blood flow.

Bloom's: Level 2. Understand

Learning Outcome: 13.08

Section: 13.08

Topic: Respiratory System

25. In which form is most of the oxygen carried in arterial blood?

- A.** bound to hemoglobin
- B. dissolved in the plasma
- C. dissolved in the cytosol of erythrocytes
- D. converted to HCO_3^-
- E. bound to myoglobin

Bloom's: Level 1. Remember
Learning Outcome: 13.04
Section: 13.04
Topic: Respiratory System

26. If all other factors remain the same, which of these results in an increase in the amount of oxygen bound to hemoglobin?
- A. increased plasma $[\text{H}^+]$
 - B. increased plasma temperature
 - C. increased plasma [2,3 diphosphoglycerate]
 - D.** increased plasma P_{O_2}
 - E. increased plasma [carbon monoxide]

Bloom's: Level 1. Remember
Learning Outcome: 13.04
Section: 13.04
Topic: Respiratory System

27. Which of these is demonstrated by the oxygen-hemoglobin dissociation curve?
- A. The greater the P_{O_2} of the blood, the greater the dissociation of O_2 from hemoglobin.
 - B.** At normal resting systemic arterial P_{O_2} , hemoglobin is almost 100% saturated with oxygen.
 - C. At normal resting systemic venous P_{O_2} , only about 75% of the hemoglobin is in the form of deoxyhemoglobin.
 - D. More additional oxygen binds to hemoglobin when going from a P_{O_2} of 60 to 100 mmHg, than is added when going from a P_{O_2} of 40 to 60 mmHg.
 - E. As P_{O_2} increases, the saturation of hemoglobin with oxygen increases linearly.

Bloom's: Level 2. Understand
Learning Outcome: 13.04
Section: 13.04
Topic: Respiratory System

28. Curve B below represents the oxygen-hemoglobin dissociation curve for normal body temperature, arterial hydrogen ion concentration, and DPG concentration.
- A. Curve A may represent the dissociation at higher than normal arterial H^+ concentration.
 - B. Curve C may represent the dissociation at lower than normal body temperature.
 - C.** Curve A may represent the dissociation at very low 2,3 diphosphoglycerate levels.
 - D. Curve C may represent the dissociation at lower than normal arterial H^+ concentration.
 - E. Curve A may represent the dissociation at higher than normal body temperature.

Bloom's: Level 2. Understand
Learning Outcome: 13.04

29. Which of the following would cause a *decrease* in the binding affinity of hemoglobin for oxygen?
- A. increased pH of the blood
 - B. increased temperature of the blood**
 - C. decreased DPG levels in erythrocytes
 - D. the presence of carbon monoxide
 - E. decreased concentration of H⁺ in the blood

Bloom's: Level 1. Remember
Learning Outcome: 13.04
Section: 13.04
Topic: Respiratory System

30. Carbonic anhydrase catalyzes a reaction that combines which of the following?
- A. H₂O and O₂
 - B. H₂O and CO₂**
 - C. H₂O and CO
 - D. H⁺ and HCO₃⁻
 - E. CO₂ and O₂

Bloom's: Level 1. Remember
Learning Outcome: 13.05
Section: 13.05
Topic: Respiratory System

31. After CO₂ is produced by tissues, in what form is most of that carbon transported to the lungs for removal from the body?
- A. as dissolved CO₂
 - B. bound to hemoglobin
 - C. as H₂CO₃
 - D. as dissolved HCO₃⁻**
 - E. as carbonic anhydrase

Bloom's: Level 1. Remember
Learning Outcome: 13.05
Section: 13.05
Topic: Respiratory System

32. Which of the following statements regarding the transport of CO₂ in blood is FALSE?
- A. Some of the CO₂ in blood is dissolved in plasma.
 - B. Some of the CO₂ in blood is dissolved in the cytosol of erythrocytes.
 - C. Some of the CO₂ in blood is bound to hemoglobin.
 - D. Most of the CO₂ in blood is converted to another molecule.

E. Some of the CO₂ in blood is converted to chloride.

Bloom's: Level 1. Remember

Learning Outcome: 13.05

Section: 13.05

Topic: Respiratory System

33. Which is a result of hyperventilation?

- A.** respiratory alkalosis
- B. respiratory acidosis
- C. increased blood P_{CO2}
- D. metabolic acidosis
- E. metabolic alkalosis

Bloom's: Level 1. Remember

Learning Outcome: 13.06

Section: 13.06

Topic: Respiratory System

34. Which occurs as a result of hypoventilation?

- A. the pH of the blood increases
- B. levels of blood O₂ increase
- C.** levels of blood H⁺ ions increase
- D. alveolar CO₂ decreases to near atmospheric levels
- E. alveolar oxygen increases toward atmospheric levels

Bloom's: Level 1. Remember

Learning Outcome: 13.06

Section: 13.06

Topic: Respiratory System

35. Which of these correctly describes the chloride shift?

- A. In the lungs, chloride enters red blood cells in exchange for bicarbonate ions.
- B. In the tissues, chloride exits red blood cells in exchange for carbonic acid.
- C.** In the tissues, chloride enters red blood cells in exchange for bicarbonate ions.
- D. In the lungs, chloride enters red blood cells in exchange for CO₂.
- E. In the tissues, chloride enters red blood cells in exchange for CO₂.

Bloom's: Level 1. Remember

Learning Outcome: 13.05

Section: 13.05

Topic: Respiratory System

36. Which is a proposed benefit of hemoglobin's ability to bind and transport nitric oxide?

- A. It allows hemoglobin to resist the effects of small pH changes as a buffer molecule.
- B.** By circulating into peripheral vessels, it will trigger vasodilation to improve local blood flow.
- C. As it circulates it promotes smooth muscle of arteries and arterioles to contract, to increase blood

pressure as needed.

- D. It acts as an enzyme cofactor necessary to maintaining a "clean and smooth" endothelial lining within blood vessels.
- E. It provides a carrier upon which additional electrolytes can be transported to deficient tissues in the body.

Bloom's: Level 1. Remember

Learning Outcome: 13.06

Section: 13.06

Topic: Respiratory System

37. What brain center has neurons that fire mainly during inspiration and have input to the spinal motor neurons that activate the diaphragm and inspiratory intercostal muscles?

- A. the ventral respiratory group of the medulla oblongata
- B. the pre-Botzinger complex
- C.** the dorsal respiratory group of the medulla oblongata
- D. the pneumotaxic center of the pons
- E. the apneustic center of the pons

Bloom's: Level 1. Remember

Learning Outcome: 13.07

Section: 13.07

Topic: Respiratory System

38. Action potentials in neurons in the inspiratory center of the medulla result in action potentials in the _____ nerves to the diaphragm, which in turn cause _____ of the muscle, resulting in a/an _____ in the volume of the thoracic cage.

- A. motor; contraction; decrease
- B. parasympathetic; contraction; decrease
- C. sympathetic; contraction; increase
- D.** motor; contraction; increase
- E. sympathetic; relaxation; increase

Bloom's: Level 1. Remember

Learning Outcome: 13.07

Section: 13.07

Topic: Respiratory System

39. Which of the following are chemoreceptors?

- A. hair cells in the cochlea
- B.** receptors in the aortic and carotid bodies
- C. baroreceptors in the aortic and carotid arch
- D. receptors that mediate the Hering-Breuer reflex

Bloom's: Level 1. Remember

Learning Outcome: 13.07

Section: 13.07

Topic: Respiratory System

40. Which of the following is most responsible for detecting an increase in systemic arterial H⁺ concentration?

- A. the medulla of the brainstem
- B.** the peripheral chemoreceptors
- C. the central chemoreceptors
- D. the diaphragm
- E. the dorsal respiratory group

Bloom's: Level 1. Remember

Learning Outcome: 13.07

Section: 13.07

Topic: Respiratory System

41. What is the primary regulator of the magnitude of alveolar ventilation under normal circumstances?

- A.** the H^+ concentration in the brain extracellular fluid, which is monitored by central chemoreceptors
- B. The PO_2 of the arterial blood, which is monitored by central chemoreceptors
- C. The PO_2 of the arterial blood, which is monitored by peripheral chemoreceptors
- D. the H^+ concentration in the arterial blood, which is monitored by central chemoreceptors
- E. stretch receptors in the lung

Bloom's: Level 2. Understand

Learning Outcome: 13.07

Section: 13.07

Topic: Respiratory System

42. Which of the following statements regarding control of respiration is correct?

- A. A slight decrease in arterial P_{O_2} is a stronger stimulus for increased ventilation than is a comparable decrease in arterial P_{CO_2} .
- B. The most important signal for regulating ventilation is the H^+ concentration of arterial blood.
- C.** Increased concentrations of lactic acid stimulate ventilation primarily by acting on peripheral chemoreceptors.
- D. An increase in the HCO_3^- concentration in blood stimulates ventilation.
- E. At high altitude, a decrease in P_{CO_2} of the blood stimulates an increase in ventilation.

Bloom's: Level 1. Remember

Learning Outcome: 13.07

Section: 13.07

Topic: Respiratory System

43. Which of these would tend to increase ventilation?

- A. lower than normal blood PCO_2
- B. higher than normal blood pH
- C. breathing carbon monoxide
- D. iron-deficiency anemia
- E.** breathing air with increased PCO_2

Bloom's: Level 2. Understand

Learning Outcome: 13.07

44. If the nerves from the carotid and aortic bodies are cut, which of these would occur?

- A.** A decrease in arterial P_{O_2} will no longer increase ventilation.
- B. An increase in arterial P_{CO_2} will no longer increase ventilation.
- C. An increase in arterial lactic acid will inhibit ventilation.
- D. An increase in arterial P_{CO_2} will inhibit ventilation.
- E. A decrease in arterial P_{O_2} will inhibit ventilation.

Bloom's: Level 2. Understand
Learning Outcome: 13.07
Learning Outcome: 13.08
Section: 13.07
Section: 13.08
Topic: Respiratory System

45. Which of these does NOT increase during heavy exercise?

- A. minute ventilation
- B.** arterial P_{CO_2}
- C. oxygen delivery to muscles
- D. oxygen extraction from the blood by muscles
- E. body heat production

Bloom's: Level 1. Remember
Learning Outcome: 13.03
Learning Outcome: 13.07
Section: 13.03
Section: 13.07
Topic: Respiratory System

46. Following strenuous exercise, blood levels of lactic acid are _____ compared to pre-exercise levels. This change in acid concentration causes a reflex _____ in ventilation by activating _____.

- A. decreased; decrease; peripheral chemoreceptors
- B. decreased; decrease; central chemoreceptors
- C. increased; increase; baroreceptors in the aortic arch
- D. increased; increase; central chemoreceptors
- E.** increased; increase; peripheral chemoreceptors

Bloom's: Level 1. Remember
Learning Outcome: 13.07
Section: 13.07
Topic: Respiratory System

47. Which of the following statements regarding hypoxia is correct?

- A.** Exposure to high altitude is a form of hypoxic hypoxia.
- B. "Anemic hypoxia" refers to the condition of lower than normal arterial P_{O_2} .
- C. Carbon monoxide poisoning is an example of hypoxic hypoxia.
- D. Carbon monoxide poisoning is an example of ischemic hypoxia.

E. Cyanide poisoning is an example of hypoxic hypoxia.

Bloom's: Level 1. Remember
Learning Outcome: 13.08
Section: 13.08
Topic: Respiratory System

48. Which of the following conditions would result in a systemic arterial P_{O_2} lower than is typical of a healthy person at sea level?

- A.** traveling to high altitude
- B. breathing 100% oxygen
- C. having iron-deficiency anemia
- D. breathing regular air in a hyperbaric chamber (higher than normal atmospheric pressure)
- E. maintaining alveolar ventilation constant while decreasing metabolic rate

Bloom's: Level 1. Remember
Learning Outcome: 13.08
Section: 13.08
Topic: Respiratory System

49. Which is characteristic of a person chronically suffering from hypoxic hypoxia?

- A. higher-than-normal alveolar P_{O_2}
- B.** higher-than-normal hematocrit
- C. higher-than-normal arterial P_{O_2}
- D. lower-than-normal lactic acid production
- E. lower-than-normal blood flow through tissues

Bloom's: Level 1. Remember
Learning Outcome: 13.08
Section: 13.08
Topic: Respiratory System

50. Which correctly describes the cause of the increase in alveolar ventilation that occurs when a person ascends to high altitude?

- A. The decrease in P_{CO_2} of inspired air decreases alveolar P_{CO_2} , stimulating the peripheral chemoreceptors.
- B. The decrease in P_{CO_2} of inspired air decreases alveolar P_{CO_2} , stimulating the central chemoreceptors.
- C.** The decrease in P_{O_2} of inspired air decreases alveolar and arterial P_{O_2} , stimulating the peripheral chemoreceptors.
- D. The decrease in total atmospheric pressure causes a greater negative pressure in the intrapleural space, resulting in deeper and more frequent breathing.
- E. The decrease in the total barometric pressure at high altitude causes hypocapnea, which stimulates peripheral chemoreceptors.

Bloom's: Level 1. Remember
Learning Outcome: 13.07
Learning Outcome: 13.08
Section: 13.07

Section: 13.08
Topic: Respiratory System

51. The diaphragm is a large sheet of smooth muscle that separates the thoracic cavity from the abdomen.

FALSE

Bloom's: Level 1. Remember
Learning Outcome: 13.01
Section: 13.01
Topic: Respiratory System

52. If the parietal pleura is cut during surgery, the lung on the side of the cut will expand and the chest wall will be compressed.

FALSE

Bloom's: Level 2. Understand
Learning Outcome: 13.02
Section: 13.02
Topic: Respiratory System

53. The process of ventilation includes both the transport of gases by bulk flow and the diffusion of gases into and out of the blood.

FALSE

Bloom's: Level 1. Remember
Learning Outcome: 13.02
Section: 13.02
Topic: Respiratory System

54. According to Boyle's law, the pressure exerted by a constant number of gas molecules in a container is inversely proportional to the volume of the container. Therefore, increasing the volume of the container will cause a decrease in its pressure.

TRUE

Bloom's: Level 1. Remember
Learning Outcome: 13.02
Section: 13.02
Topic: Respiratory System

55. During inhalation/inspiration, the total alveolar volume decreases.

FALSE

Bloom's: Level 2. Understand
Learning Outcome: 13.02
Section: 13.02
Topic: Respiratory System

56. During inhalation/inspiration, the diaphragm contracts and the alveolar pressure is less than atmospheric

pressure; during exhalation/expiration, the diaphragm relaxes and the alveolar pressure is greater than atmospheric pressure.

TRUE

*Bloom's: Level 1. Remember
Learning Outcome: 13.02
Section: 13.02
Topic: Respiratory System*

57. In a normal person at rest, the part of the respiratory cycle in which no air is flowing through the airways and the respiratory muscles are relaxed is at the end of inhalation/inspiration, prior to exhalation/expiration.

FALSE

*Bloom's: Level 1. Remember
Learning Outcome: 13.02
Section: 13.02
Topic: Respiratory System*

58. Exhalation/expiration of air from the lungs requires contraction of the exhalatory/expiratory intercostal muscles.

FALSE

*Bloom's: Level 1. Remember
Learning Outcome: 13.02
Section: 13.02
Topic: Respiratory System*

59. Infants born prematurely frequently develop respiratory distress syndrome of the newborn because they have too few alveoli to exchange O₂ and CO₂ efficiently.

FALSE

*Bloom's: Level 1. Remember
Learning Outcome: 13.02
Section: 13.02
Topic: Respiratory System*

60. The diameter of the airways in normal lungs is generally great enough that little resistance is offered to airflow.

TRUE

*Bloom's: Level 1. Remember
Learning Outcome: 13.02
Section: 13.02
Topic: Respiratory System*

61. Emphysema is a disease characterized by low lung compliance, obstructed airways, and ventilation-perfusion inequality.

FALSE

*Bloom's: Level 1. Remember
Learning Outcome: 13.08
Section: 13.08
Topic: Respiratory System*

62. A clinical sign of obstructive lung disease would be a reduced FEV1/FVC ratio.

TRUE

*Bloom's: Level 1. Remember
Learning Outcome: 13.02
Section: 13.02
Topic: Respiratory System*

63. The total dead space in the lungs includes anatomic dead space and any portion of the alveoli that has little or no blood supply.

TRUE

*Bloom's: Level 1. Remember
Learning Outcome: 13.02
Section: 13.02
Topic: Respiratory System*

64. Doubling the frequency of breathing will cause a greater increase in alveolar ventilation than will doubling the depth of inspiration.

FALSE

*Bloom's: Level 2. Understand
Learning Outcome: 13.02
Section: 13.02
Topic: Respiratory System*

65. At sea level P_{O_2} is about 760 mm Hg.

FALSE

*Bloom's: Level 1. Remember
Learning Outcome: 13.03
Section: 13.03
Topic: Respiratory System*

66. In the systemic circulation, the P_{O_2} of arterial blood exceeds the P_{O_2} of venous blood, while the reverse is true for the pulmonary circulation.

TRUE

*Bloom's: Level 1. Remember
Learning Outcome: 13.03*

Section: 13.03
Topic: Respiratory System

67. Decreased alveolar P_{O_2} causes reflex vasodilation of the pulmonary arterioles.

FALSE

Bloom's: Level 2. Understand
Learning Outcome: 13.03
Section: 13.03
Topic: Respiratory System

68. Most of the O_2 carried in the blood is dissolved in plasma.

FALSE

Bloom's: Level 1. Remember
Learning Outcome: 13.04
Section: 13.04
Topic: Respiratory System

69. When blood flows into the systemic capillaries, the P_{O_2} of the erythrocytes is greater than the P_{O_2} of the plasma, causing a shift from oxyhemoglobin to deoxyhemoglobin.

TRUE

Bloom's: Level 2. Understand
Learning Outcome: 13.04
Section: 13.04
Topic: Respiratory System

70. If lung disease results in an arterial P_{O_2} of 80 mm Hg, the total amount of oxygen carried by the blood is 20% below normal.

FALSE

Bloom's: Level 3. Apply
Learning Outcome: 13.04
Section: 13.04
Topic: Respiratory System

71. Mixed venous blood in a resting individual still contains more than double the amount of oxygen extracted by the tissues as the blood passed through them.

TRUE

Bloom's: Level 2. Understand
Learning Outcome: 13.04
Section: 13.04
Topic: Respiratory System

72. The affinity of hemoglobin for O₂ is decreased in rapidly metabolizing tissues.

TRUE

*Bloom's: Level 1. Remember
Learning Outcome: 13.04
Section: 13.04
Topic: Respiratory System*

73. Of the CO₂ returning from the tissues in venous blood, more is dissolved in plasma as CO₂ than is bound to hemoglobin.

FALSE

*Bloom's: Level 1. Remember
Learning Outcome: 13.05
Section: 13.05
Topic: Respiratory System*

74. Deoxyhemoglobin binds bicarbonate ion better than oxyhemoglobin does.

FALSE

*Bloom's: Level 2. Understand
Learning Outcome: 13.05
Learning Outcome: 13.06
Section: 13.05
Section: 13.06
Topic: Respiratory System*

75. Normally, all the H⁺ ions generated from CO₂ in tissue capillaries recombine with bicarbonate in pulmonary capillaries and are removed from the body as CO₂.

TRUE

*Bloom's: Level 1. Remember
Learning Outcome: 13.05
Learning Outcome: 13.06
Section: 13.05
Section: 13.06
Topic: Respiratory System*

76. The majority of hydrogen ions generated in the formation of carbonic acid in the tissues are carried as freely dissolved H⁺ in the venous blood.

FALSE

*Bloom's: Level 1. Remember
Learning Outcome: 13.06
Section: 13.06
Topic: Respiratory System*

77. When a person hyperventilates, there are lower than normal levels of P_{CO_2} and hydrogen ion in arterial blood, a condition called respiratory alkalosis.

TRUE

Bloom's: Level 1. Remember

Learning Outcome: 13.06

Section: 13.06

Topic: Respiratory System

78. The rhythmic contractions and relaxations of the inspiratory muscles are dependent upon spontaneous depolarizations of the diaphragm.

FALSE

Bloom's: Level 1. Remember

Learning Outcome: 13.07

Section: 13.07

Topic: Respiratory System

79. The neurons responsible for the cyclic nature of respiratory muscle function are located in the brain stem.

TRUE

Bloom's: Level 1. Remember

Learning Outcome: 13.07

Section: 13.07

Topic: Respiratory System

80. The medullary inspiratory neurons receive inhibitory neural input from the pons and also from pulmonary stretch receptors.

TRUE

Bloom's: Level 1. Remember

Learning Outcome: 13.07

Section: 13.07

Topic: Respiratory System

81. A decrease in arterial P_{O_2} stimulates increased ventilation by causing increased firing of action potentials in the afferent neurons from the carotid and aortic body chemoreceptors.

TRUE

Bloom's: Level 1. Remember

Learning Outcome: 13.07

Section: 13.07

Topic: Respiratory System

82. A slight fall in arterial P_{CO_2} is a much stronger stimulus for increasing ventilation than a comparable

fall in arterial P_{O_2} .

TRUE

Bloom's: Level 2. Understand
Learning Outcome: 13.07
Section: 13.07
Topic: Respiratory System

83. The most important signal for regulating normal ventilation is hydrogen ions in the blood generated by lactic acid production.

FALSE

Bloom's: Level 1. Remember
Learning Outcome: 13.07
Section: 13.07
Topic: Respiratory System

84. Increased plasma concentration of lactic acid stimulates increased ventilation primarily by means of central chemoreceptors.

FALSE

Bloom's: Level 1. Remember
Learning Outcome: 13.07
Section: 13.07
Topic: Respiratory System

85. During moderate exercise, arterial P_{CO_2} and H^+ concentration increase and arterial P_{O_2} decreases, and these are the main stimuli causing increased ventilation.

FALSE

Bloom's: Level 1. Remember
Learning Outcome: 13.07
Section: 13.07
Topic: Respiratory System

86. One cause of hypoxic hypoxia in disease is diffusion impairment of O_2 resulting from decreased alveolar surface area.

TRUE

Bloom's: Level 1. Remember
Learning Outcome: 13.08
Section: 13.08
Topic: Respiratory System

87. Exposure to high altitude is a form of ischemic hypoxia.

FALSE

Bloom's: Level 1. Remember
Learning Outcome: 13.07
Section: 13.07
Topic: Respiratory System

88. A small amount of carbon monoxide in the air would not significantly alter the P_{O_2} of inspired air nor the P_{O_2} of the arterial blood.

TRUE

Bloom's: Level 1. Remember
Learning Outcome: 13.07
Section: 13.07
Topic: Respiratory System

89. The key difference between fetal hemoglobin and adult hemoglobin is that fetal hemoglobin has a lower affinity for oxygen, because the levels of oxygen in placental blood is 2 to 3 times higher than other systemic arteries.

FALSE

Bloom's: Level 1. Remember
Learning Outcome: 13.04
Section: 13.04
Topic: Respiratory System

90. The control of respiration by centers in the brainstem can be over-ridden by higher brain centers when speaking, breath-holding, undergoing emotional reactions, and experiencing pain.

TRUE

Bloom's: Level 2. Understand
Learning Outcome: 13.07
Section: 13.07
Topic: Respiratory System

91. Nonrespiratory functions of the lungs include acting as "filters" for removing certain chemicals and blood clots.

TRUE

Bloom's: Level 1. Remember
Learning Outcome: 13.09
Section: 13.09
Topic: Respiratory System

Chapter 13 Test Bank Summary

<i>Category</i>	<i># of Questions</i>
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Bloom's: Level 1. Remember	62
Bloom's: Level 2. Understand	26
Bloom's: Level 3. Apply	3
Learning Outcome: 13.01	4
Learning Outcome: 13.02	26
Learning Outcome: 13.03	8
Learning Outcome: 13.04	11
Learning Outcome: 13.05	7
Learning Outcome: 13.06	7
Learning Outcome: 13.07	24
Learning Outcome: 13.08	9
Learning Outcome: 13.09	2
Section: 13.01	4
Section: 13.02	26
Section: 13.03	8
Section: 13.04	11
Section: 13.05	7
Section: 13.06	7
Section: 13.07	24
Section: 13.08	9
Section: 13.09	2
Topic: Respiratory System	91